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Kawashima et al.

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(54) **CONNECTOR**

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PCT Pub. Date: **May 16, 2019**

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H01R 13/506 (2006.01)

(52) **U.S. Cl.**
CPC ***H01R 13/533*** (2013.01); ***H01R 13/506*** (2013.01)

(58) **Field of Classification Search**
CPC ... H01R 13/533; H01R 13/506; H01R 13/516
See application file for complete search history.

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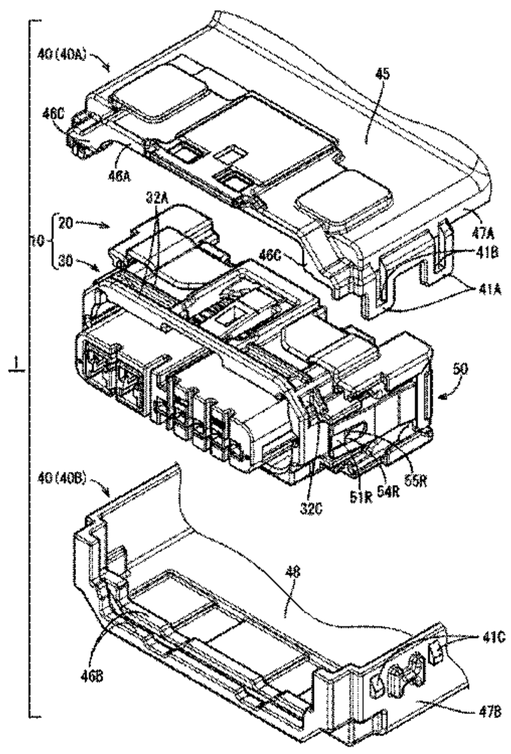
(57) **ABSTRACT**

A connector (female connector **1**) is provided with an inner housing **20** from which wires W are pulled out to outside and which is connected to a mating housing **90**, and a vibration transmitting member **30**, **40** including a mating contact portion (inner peripheral surface **31**A) capable of coming into contact with the mating housing **90**. The vibration transmitting member **30**, **40** includes a wire fixing portion **43** to which the wires W are fixed, and is capable of transmitting vibration from the wire fixing portion **43** to the mating housing **90** from the mating contact portion **31**A. The inner housing **20** is allowed to relatively move with respect to the vibration transmitting member **30**, **40**.

5 Claims, 11 Drawing Sheets



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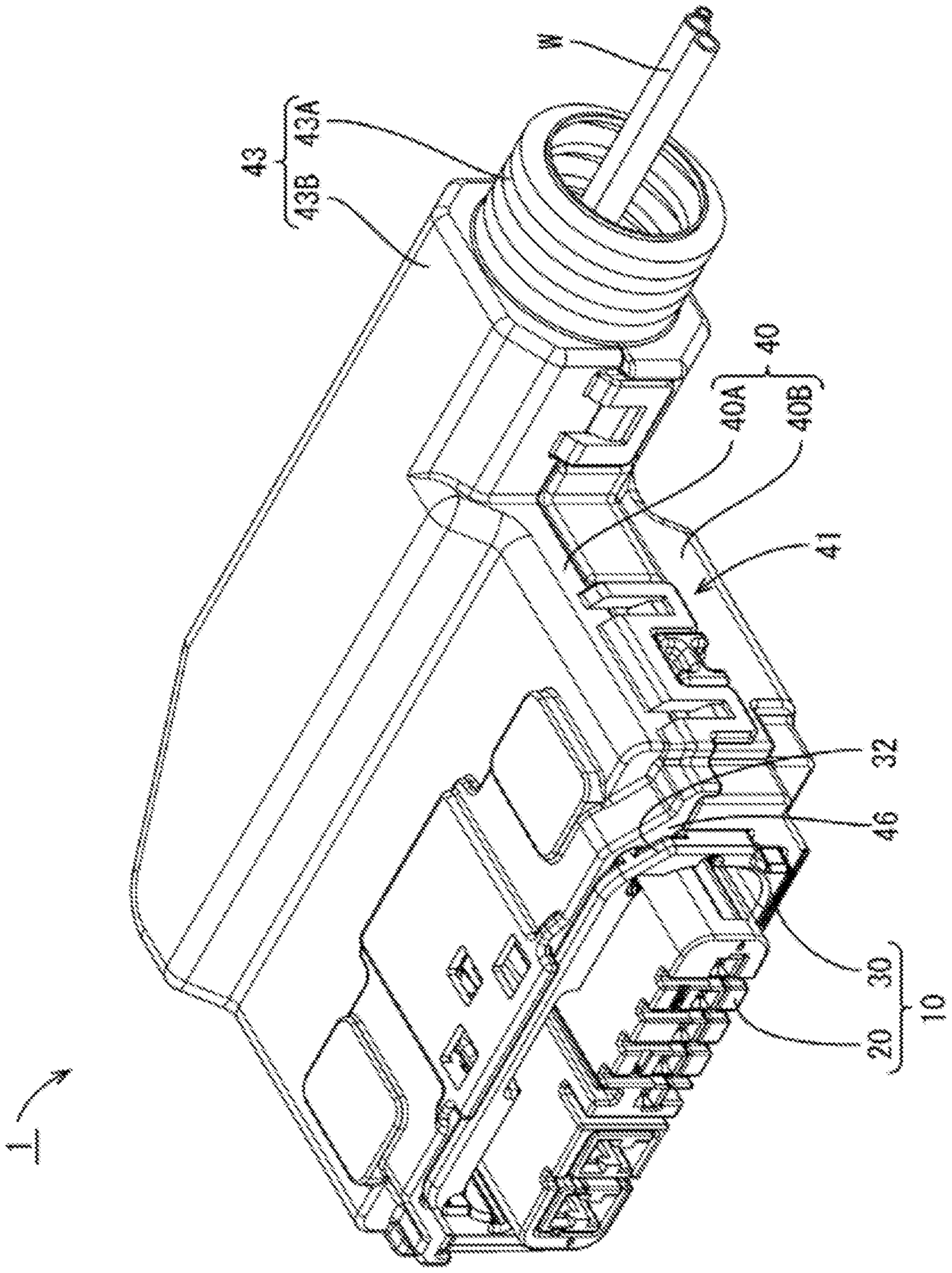
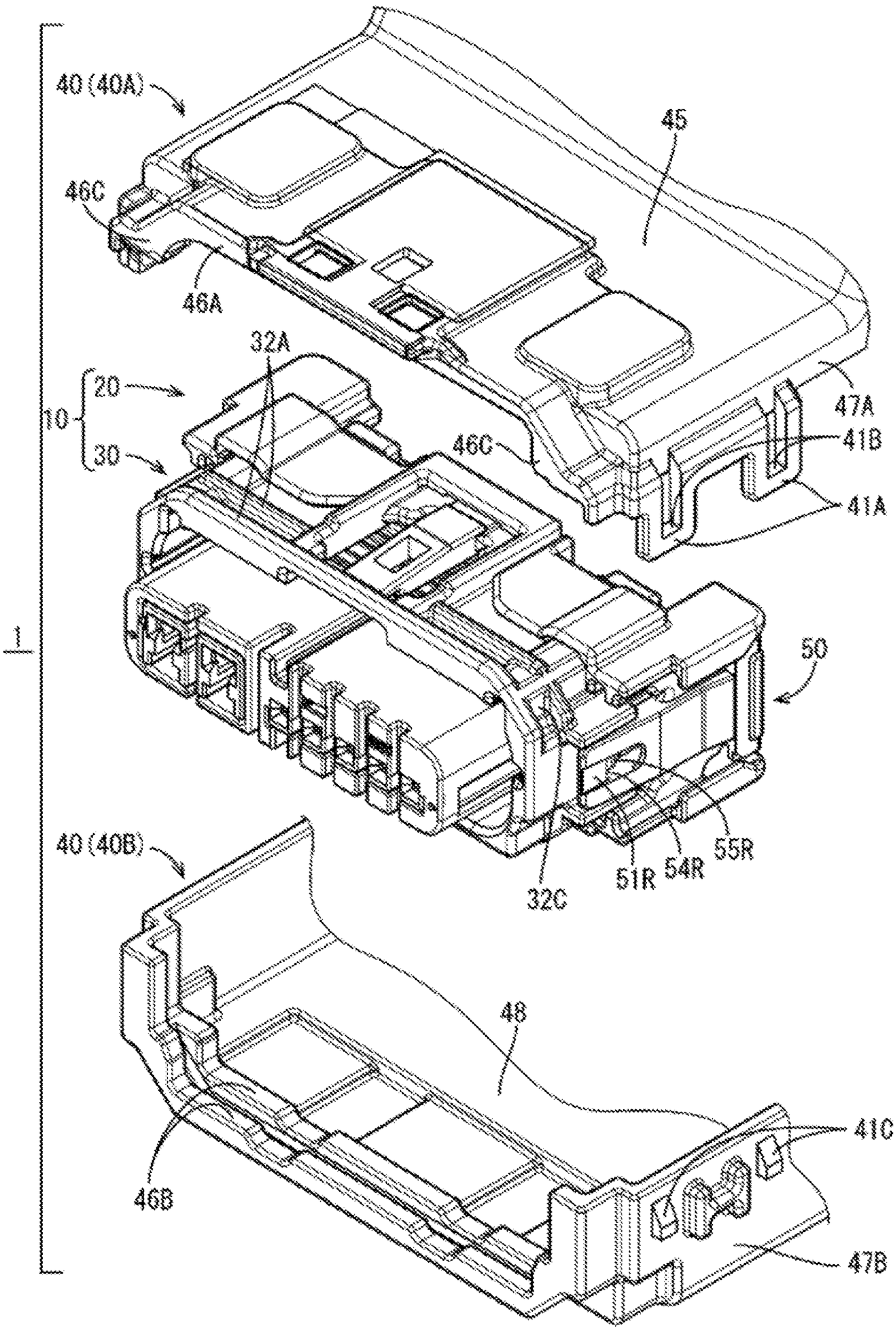


FIG. 1

FIG. 2


40 (40A)
45
46C
46A
32A
20
10
30
47A
41B
46C
41A
1
50
40 (40B)
32C
51R
54R
55R
48
41C
46B
47B

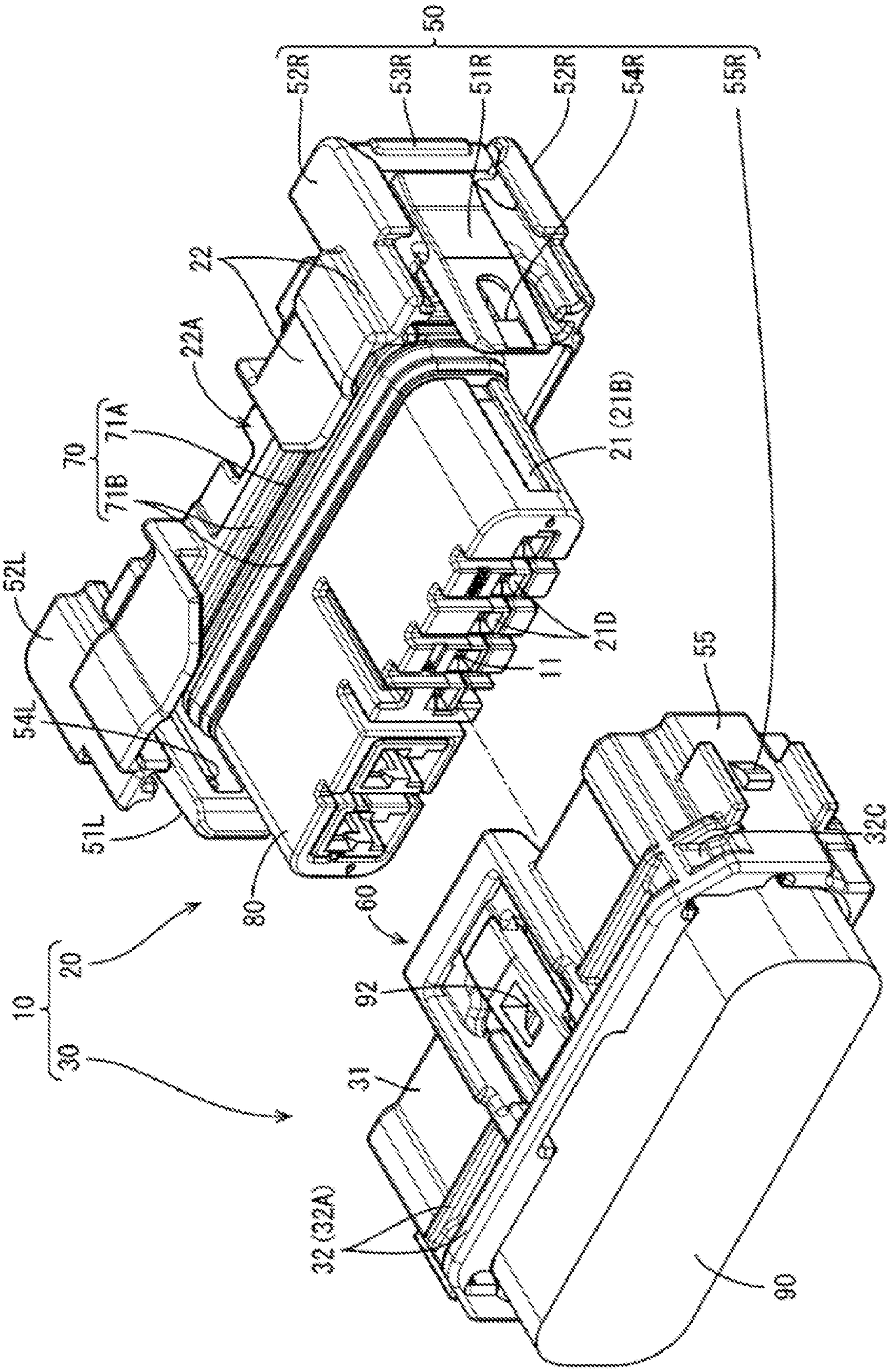

50
52R
53R
51R
52R
54R
55R
22
22A
71A
70
71B
21 (21B)
52L
54L
51L
21D
11
55
80
60
32C
20
10
92
30
31
32 (32A)
90

FIG. 3

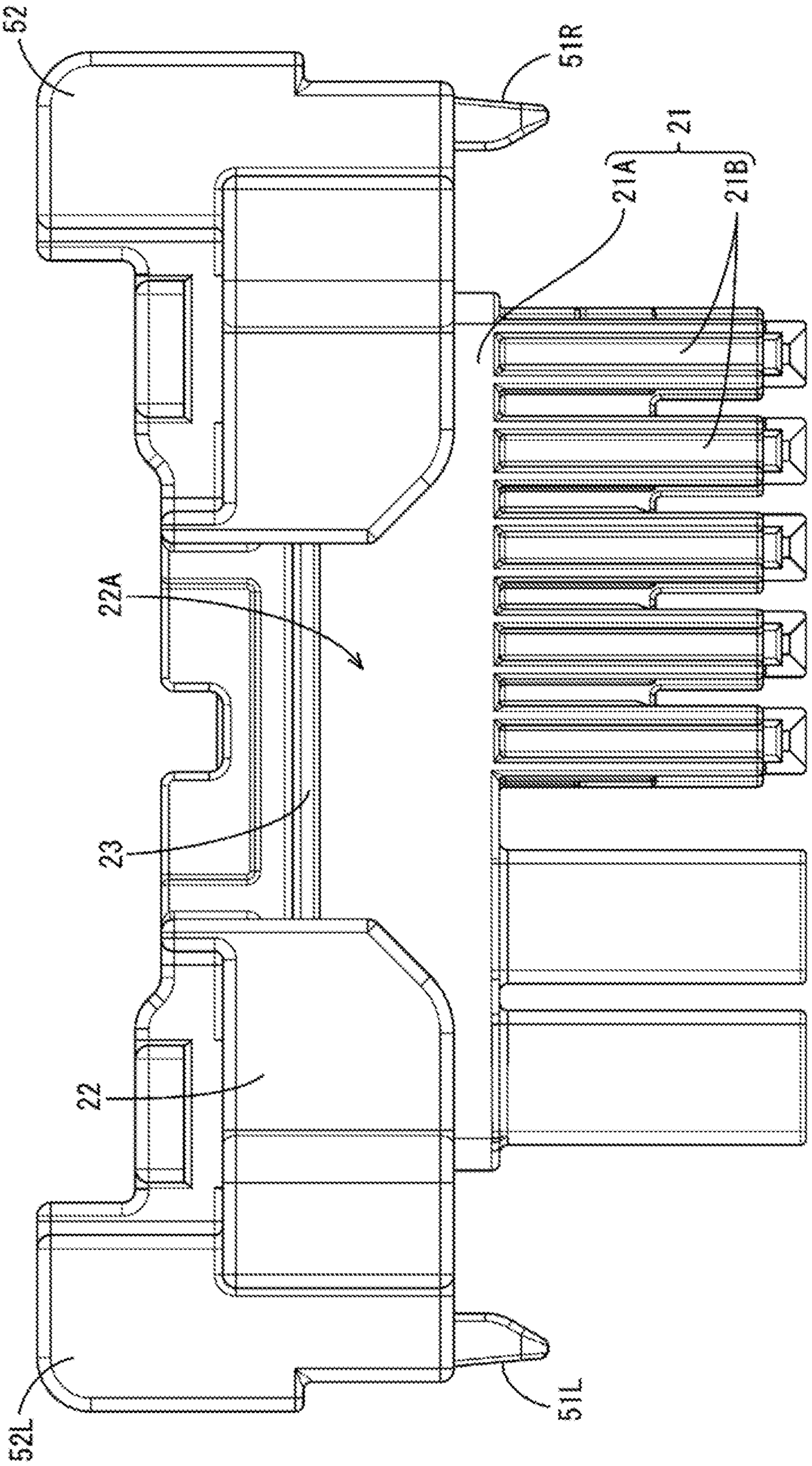


FIG. 4

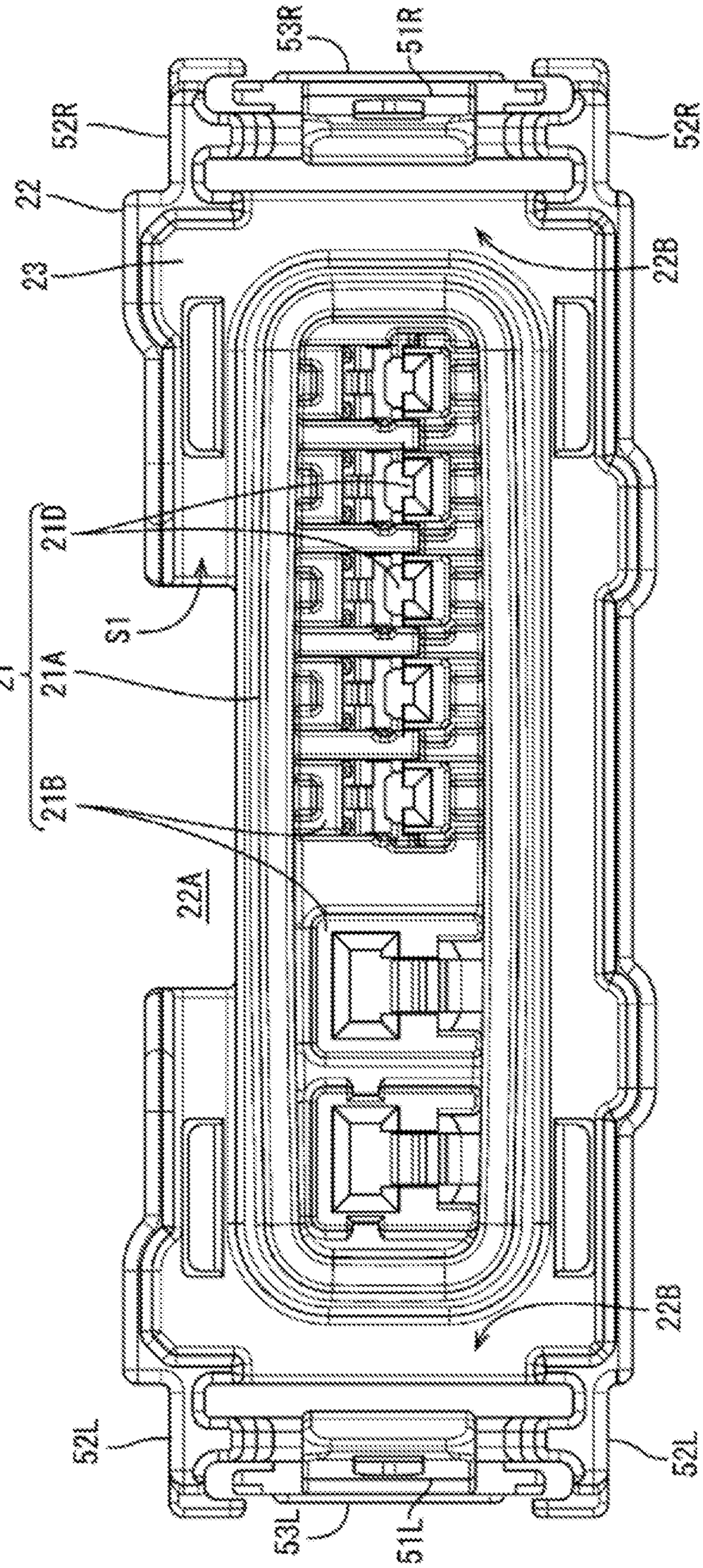

53R
51R
52R
52R
22
23
22B
21D
S1
21
21A
21B
22A
22B
52L
53L
51L
52L

FIG. 5

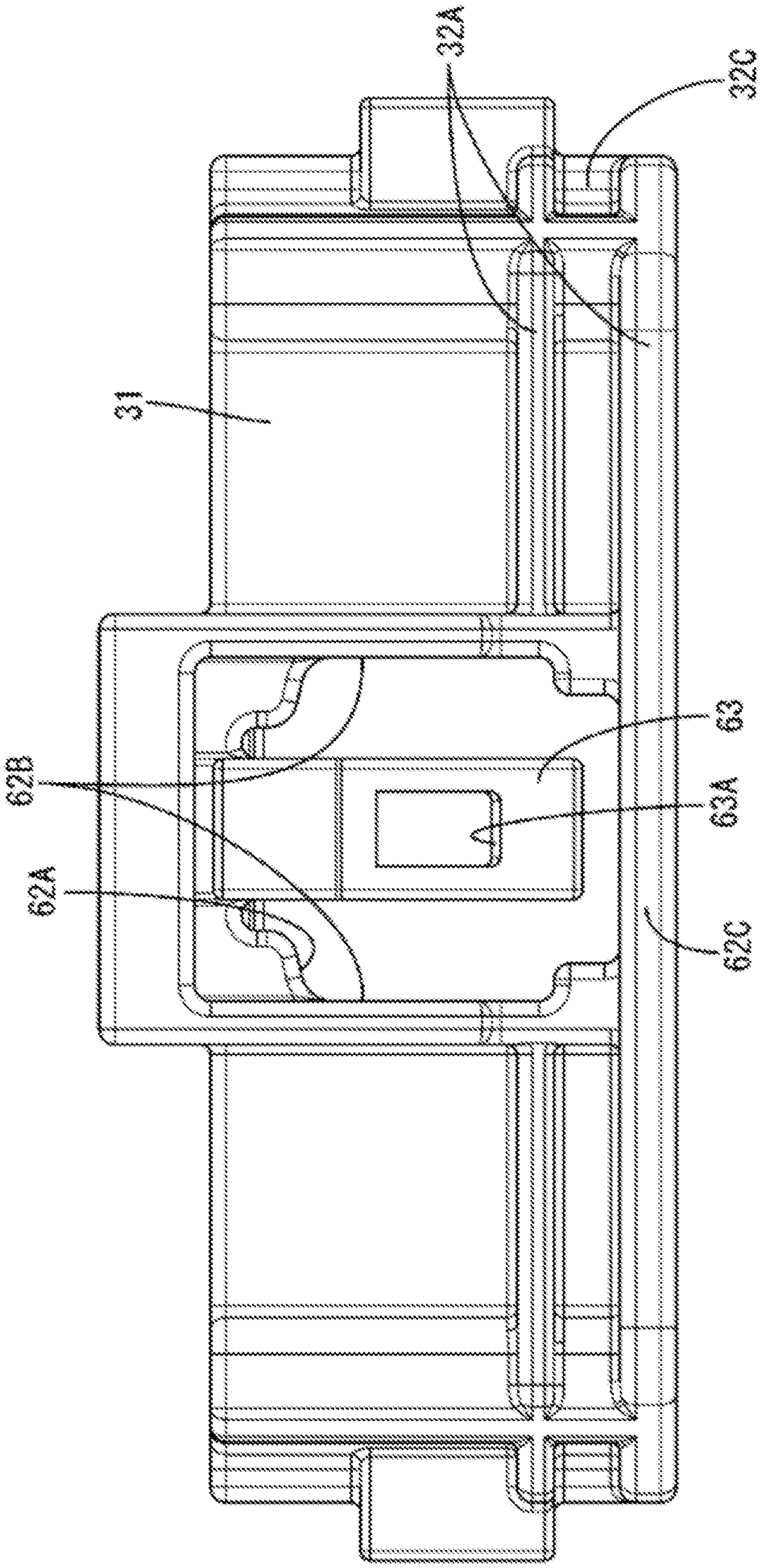


FIG. 6

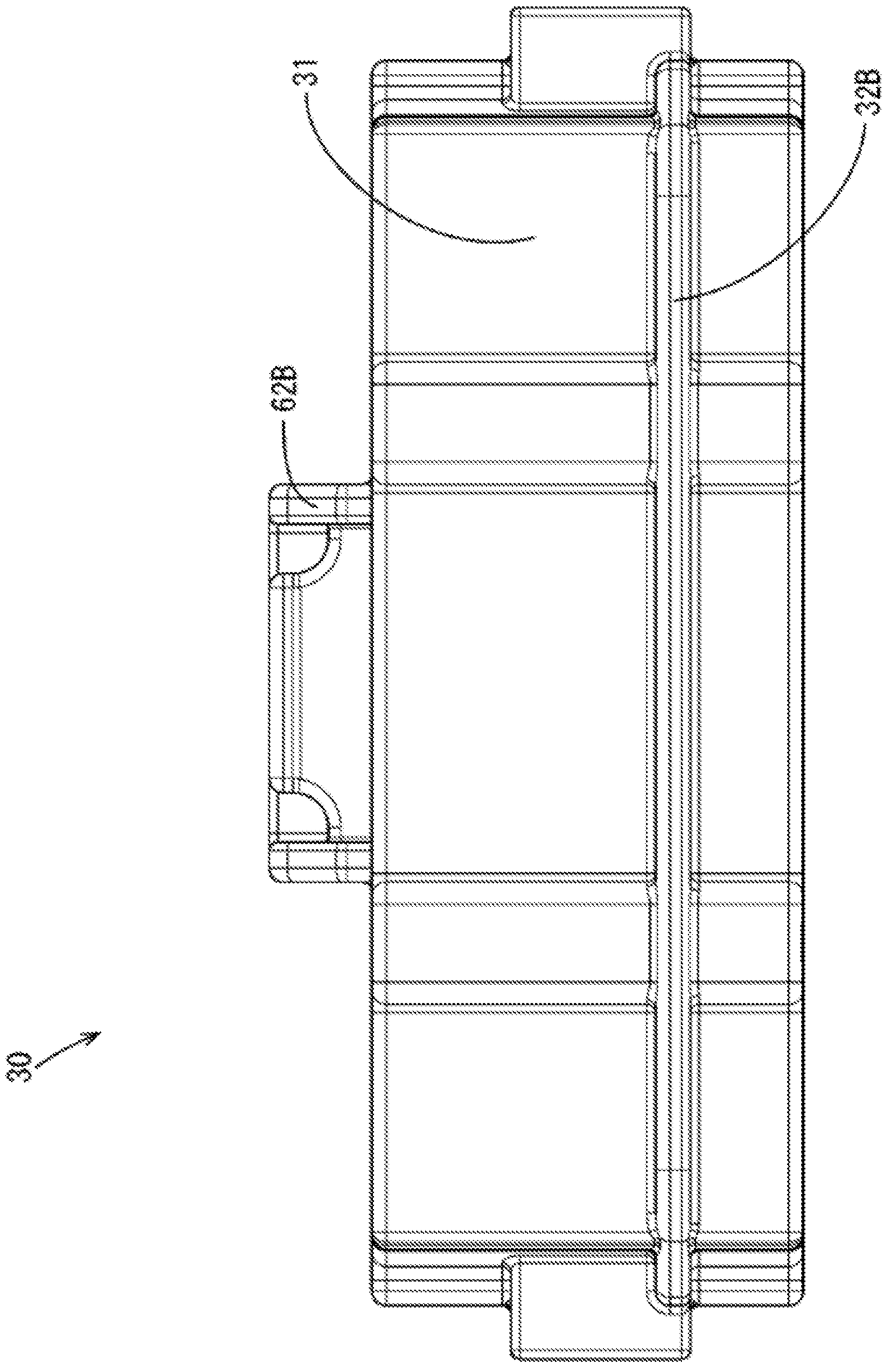


FIG. 7

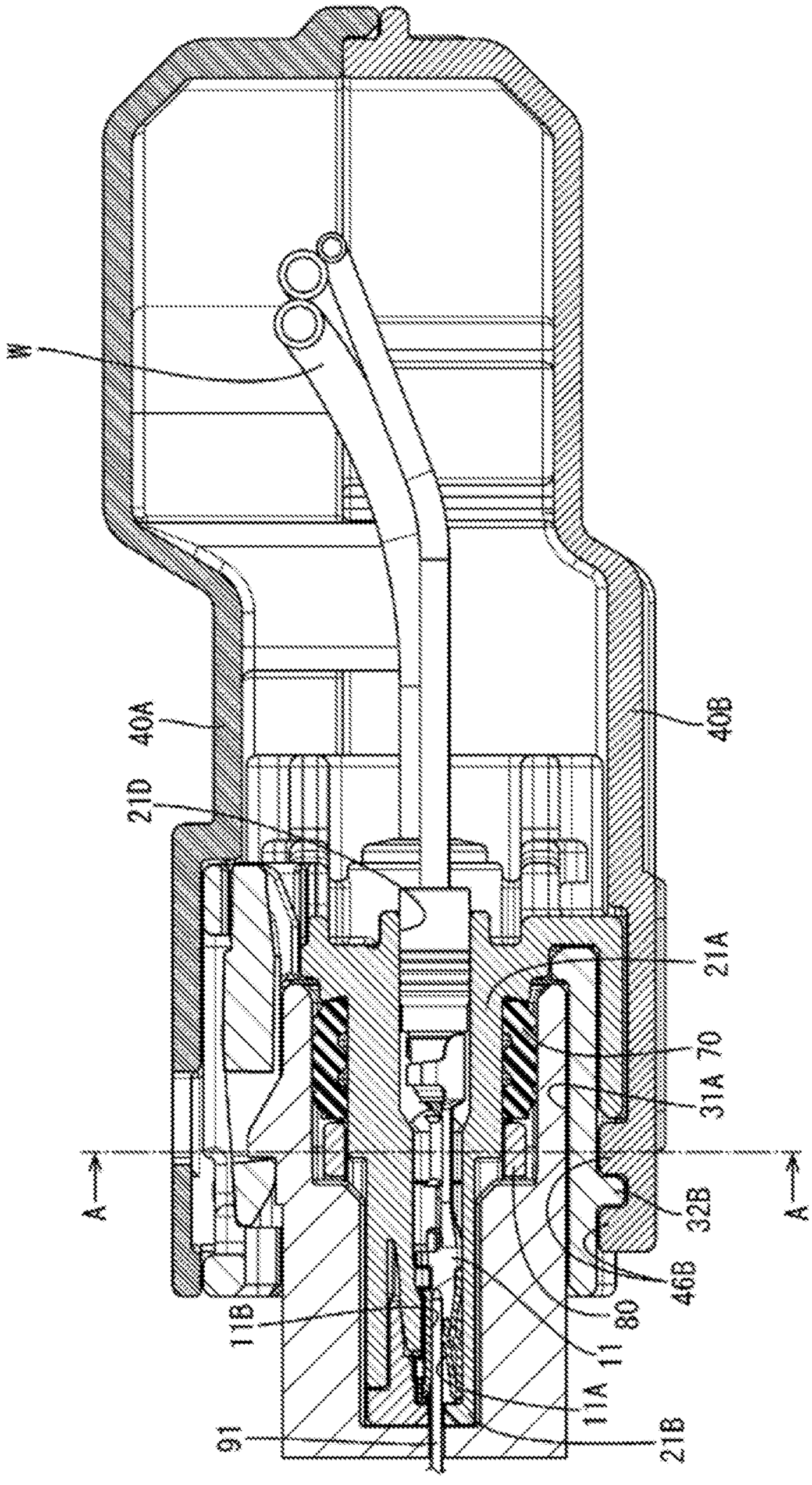


FIG. 8

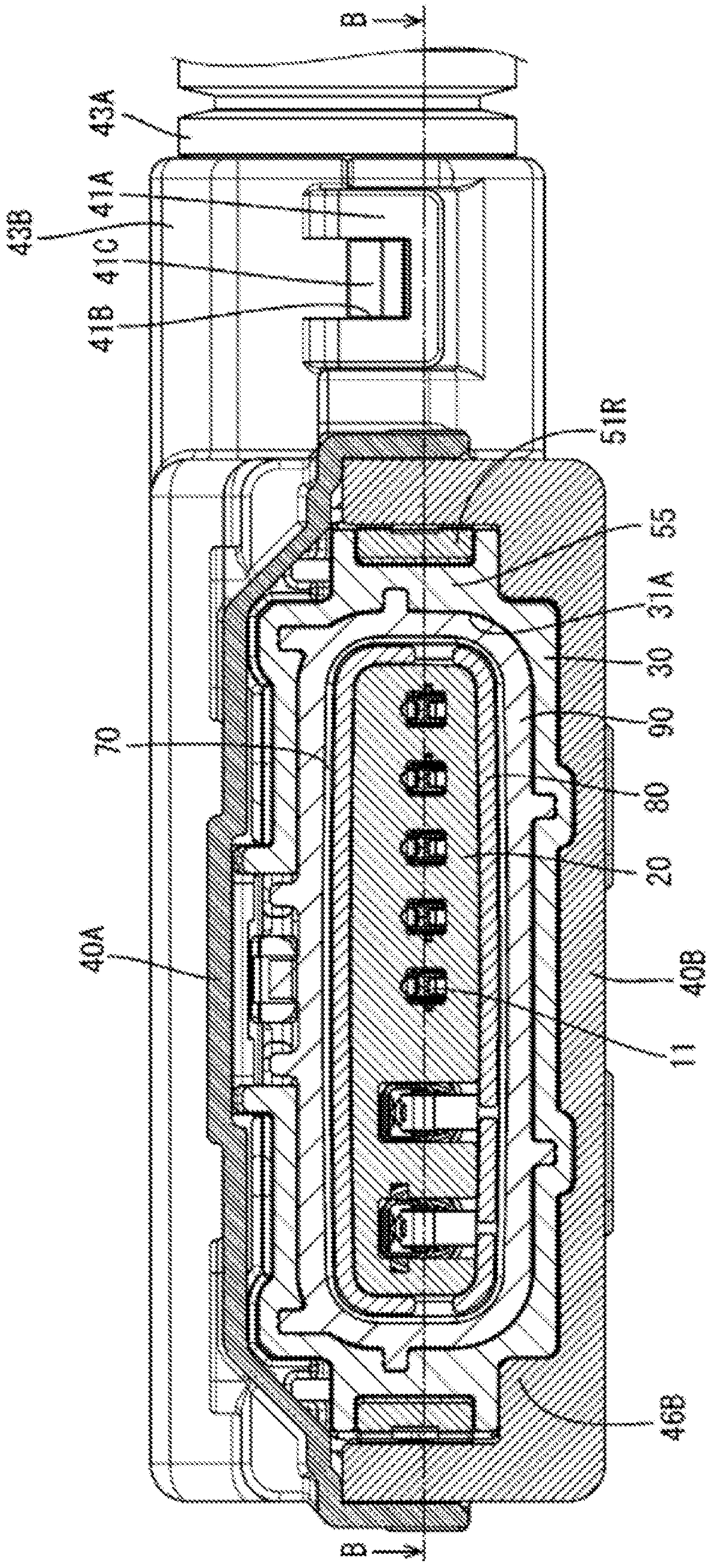


FIG. 9

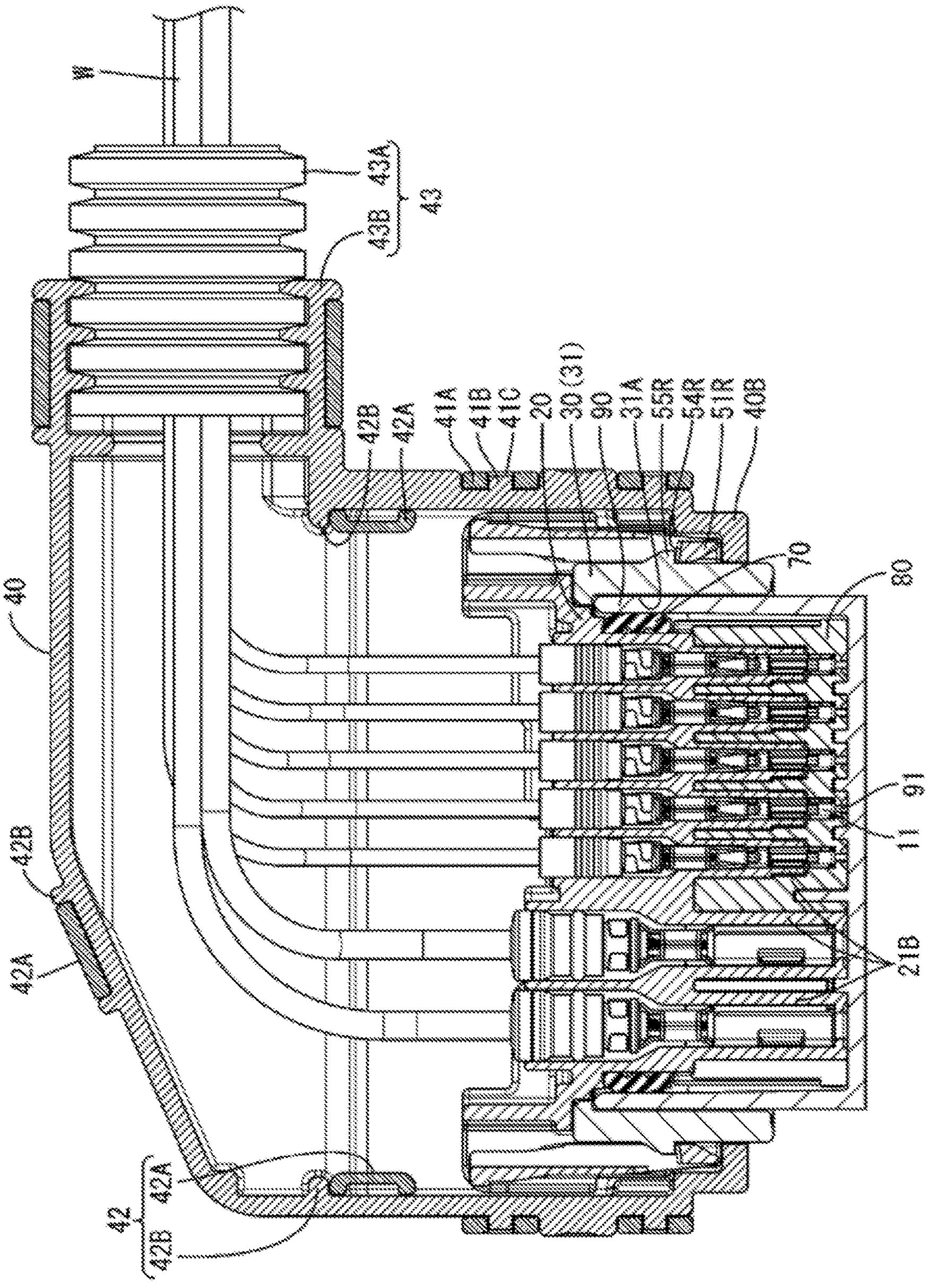

43A
43B
43
42B
42A
41A
41B
41C
20
30 (31)
90
31A
55R
54R
51R
40B
70
80
40
42B
42A
91
11
218
42
42A
42B

FIG. 10

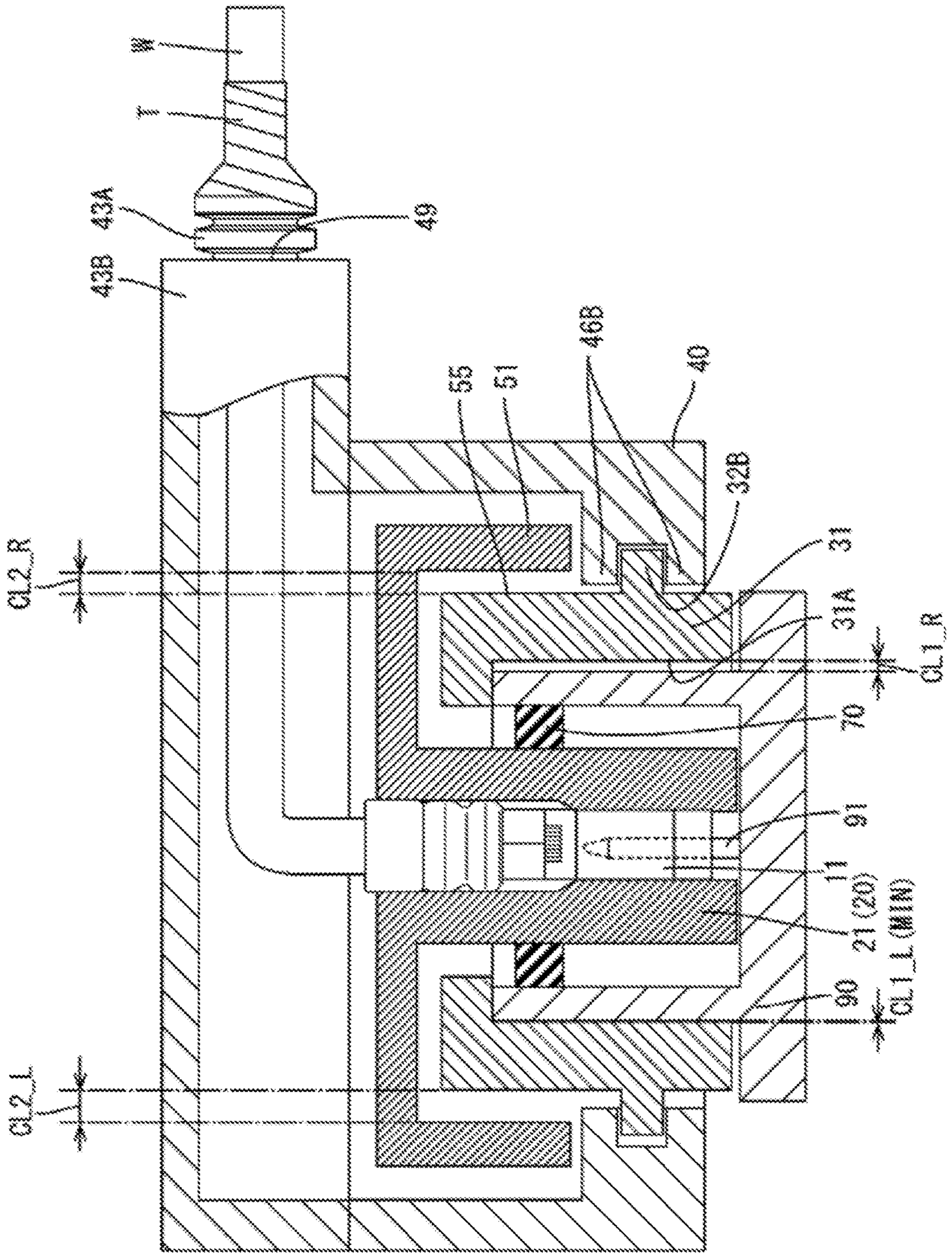

32
1
43A
49
43B
8
55
51
46B
40
32B
31
CL2_R
31A
CL1_R
70
91
11
21 (20)
CL1_L (MIN)
60
CL2_L

FIG. 11

CONNECTOR

BACKGROUND

Field of the Invention

This specification relates to a connector.

Related Art

Japanese Unexamined Patent Publication No. 2009-93896 discloses a connector including a male housing and a female housing and used in a vehicle or the like. A first housing of this connector includes an inner housing with a cavity and an outer housing with a tubular fitting. The tubular fitting is connected to a second housing that has a mating terminal.

The outer housing is assembled with the inner housing by covering the inner housing from behind with the tubular fitting. A holding hole is provided in the rear end surface of the outer housing, and a female terminal fitting is inserted into the cavity of the inner housing through this holding hole. A wire is connected to the rear end of the female terminal fitting, and a rubber plug is fit externally on the outer periphery of the wire. A body of the rubber plug is held in close contact with the inner periphery of a rear end of the cavity in a liquid-tight manner, and an anti-vibration portion provided on the rear end of the rubber plug is fit into the holding hole.

A clearance exists between the outer peripheral surface of a rear end part of the inner housing and the inner peripheral surface of a rear surface wall of the tubular fitting of the outer housing for allowing a slight relative displacement of the outer housing with respect to the inner housing. If the wire drawn out rearwardly from the outer housing vibrates in a direction intersecting an axis thereof, part of vibration energy is absorbed as kinetic energy for displacing the outer housing. In this way, vibration transmitted from the wire to the female terminal fitting is attenuated and fretting wear on a contact point between the female terminal fitting and a mating terminal fitting is prevented.

However, in this configuration, if the vibration energy of the wire cannot be absorbed sufficiently even if a displacement is made in the clearance, the outer housing contacts the inner housing and the kinetic energy is transmitted to the inner housing. As a result, the inner housing vibrates and fretting wear occurs on the contact point between the female terminal fitting and the mating terminal fitting accommodated inside the inner housing.

SUMMARY

A connector disclosed in this specification includes an inner housing, a wire pulled out to outside from the inner housing, and a vibration transmitting member. The inner housing is configured to be connected to a mating housing. The vibration transmitting member includes a mating contact portion capable of coming into contact with the mating housing and further includes a wire fixing portion that is fixed to the wire. The wire fixing portion is capable of transmitting vibration from the wire fixing portion to the mating housing from the mating contact portion, and the inner housing is allowed to move with respect to the vibration transmitting member.

According to this configuration, if the wire vibrates, that vibration is transmitted from the wire fixing portion to the mating housing via the vibration transmitting member. Thus, vibration transmitted from the wire to the inner housing can be reduced. Even if the vibration is transmitted from the wire to the inner housing, the vibration transmitted from the wire can be attenuated since the inner housing is allowed to move with respect to the vibration transmitting member. In this way, the vibration attenuated by a relative movement of the inner housing can be suppressed by a contact pressure between terminals, for example, in the case of accommodating the terminals into the inner housing and the mating housing and bringing the terminals into contact with each other. Thus, wear due to sliding movements of the terminals can be suppressed.

The inner housing may include a lock piece, and a lock projection of the vibration transmitting member is lockable to the lock piece. A clearance is provided between the lock projection and the lock piece so that the inner housing can move with respect to the vibration transmitting member. According to this configuration, the lock piece of the inner housing can be locked to the lock projection of the vibration transmitting member without the inner housing being connected to the mating housing, and these components can be handled integrally. Further, the clearance between the lock projection and the lock piece enables the inner housing and the vibration transmitting member to be handled integrally while ensuring a relative movement of the inner housing.

The vibration transmitting member includes an outer housing and a cover. The outer housing has the mating contact portion and is configured to cover the inner housing. The cover has the wire fixing portion and is configured to cover the outer housing and the wire. According to this configuration, the cover covers and protects the inner housing, the outer housing and the wire from outside.

The outer housing faces the mating housing across a first clearance and faces the inner housing across a second clearance that is larger than the first clearance. According to this configuration, even if the outer housing comes into contact with the mating housing (i.e. moves a dimension of the first clearance), the outer housing does not contact the inner housing, and vibration from the wire is not transmitted directly from the outer housing to the inner housing since that moving distance is shorter than a dimension of the second clearance.

According to the connector disclosed in this specification, it is possible to prevent the fretting wear of the terminals due to the vibration of the wire.

BRIEF DESCRIPTION OF DRAWINGS

FIG. **1** is a perspective view showing a connector according to one embodiment.

FIG. **2** is a perspective view showing a state where a cover member is removed.

FIG. **3** is a perspective view showing a state where locking by first lock portions is released.

FIG. **4** is a plan view of an inner housing.

FIG. **5** is a front view showing the inner housing.

FIG. **6** is a plan view showing an outer housing.

FIG. **7** is a bottom view showing the outer housing.

FIG. **8** is a section showing a state where a female housing and a mating housing are connected.

FIG. **9** is a section along A-A of FIG. **8**.

FIG. **10** is a section along B-B of FIG. **9**.

FIG. **11** is a conceptual diagram showing a connected state of the connector and the mating housing.

DETAILED DESCRIPTION

One embodiment is described with reference to FIGS. **1** to **11**. A female connector **1** (an example of a connector) of

this embodiment is connected electrically to a mating connector by being fit to a mating housing **90** of the mating connector and is used in a vibrating environment in which vibration often occurs (e.g. around a tire of a vehicle). As shown in FIGS. **1** and **2**, the female connector **1** includes a female housing **10** having a substantially rectangular parallelepiped shape somewhat flat as a whole and covers **40** for covering a female housing **10**. Note that, in the following description, a connection side of the female housing **10** to the mating housing **90** is referred to as a front end and an upper side in FIG. **1** is referred to as an upper side.

As shown in FIG. **3**, the female housing **10** is composed of an inner housing **20** and an outer housing **30** disposed on an outer peripheral side of the inner housing **20**. As shown in FIG. **2**, the inner housing **20** and the outer housing **30** are assembled with each other by first locks **50** provided on the inner housing **20** and the outer housing **30**.

As shown in FIGS. **4** and **5**, the inner housing **20** includes a rear wall **23**, a terminal accommodating portion **21** and a rear receptacle **22**. The terminal accommodating portion **21** is disposed in a central part of the rear wall **23** and has a wide flat shape. The rear receptacle **22** is disposed on an outer peripheral side of the terminal accommodating portion **21** and is to be fit to an outer periphery of the outer housing **30**.

The terminal accommodating portion **21** extends forward from the rear wall **23**. A rear part of the terminal accommodating portion **21** defines a base **21**A having a substantially rectangular parallelepiped shape, and a front part defines accommodating protrusions **21**B that are long in a front-rear direction. As shown in FIG. **8**, forwardly open cavities **21**D penetrate in the front-rear direction from the front ends of the respective accommodating protrusions **21**B to the rear end of the rear wall **23**. A female terminal **11** is inserted into each cavity **21**D through a rear opening. A wire W connected to the rear end of the female terminal **11** is pulled out to the outside of the inner housing **20** through the rear opening of the cavity **21**D.

As shown in FIG. **8**, the female terminal **11** includes a rectangular tube on a front side, and a cantilevered spring piece **11**A is disposed to face an inner ceiling wall **11**B of the rectangular tube inside the rectangular tube. In this way, the female terminal **11** is connected to the mating terminal **91** with a predetermined contact pressure by inserting a mating terminal **91** of the mating housing **90** into the rectangular tube.

As shown in FIG. **5**, the rear receptacle **22** extends forward from a peripheral edge of the rear wall **23** and includes a second lock receiving groove **22**A provided on an upper side of the terminal accommodating portion **21** and lock projection receiving grooves **22**B provided on both left and right sides of the terminal accommodating portion **21**. The second lock receiving groove **22**A is formed by cutting an upper central part of the rear receptacle **22** and the rear wall **23** connected thereto in the front-rear direction. On the other hand, the lock projection receiving grooves **22**B are formed by cutting both left and right sides of the rear receptacle **22** in the front-rear direction. Specifically, the rear receptacle **22** extends forward to surround the base **21**A from a part of the upper edge excluding a central part, both upper and lower end parts of left and right side edges and the entire lower edge of the rear wall **23**. A fitting space **51** is formed between the rear receptacle **22** and the base **21**A, and can receive the outer housing **30** and the mating housing **90**, as described later.

As shown in FIG. **3**, a sealing ring **70** made of a resilient material is fit on the rear end of the base **21**A. The sealing ring **70** has a rectangular frame shape with four rounded corners to correspond to the base **21**A, and is in contact with the base **21**A over the entire periphery in a liquid-tight manner. Lips **71**, **71**B are provided continuously in a circumferential direction on the outer peripheral surface of the sealing ring **70**.

As shown in FIG. **3**, the accommodating protrusions **21**B are collectively covered with a front cap **80** having a wide flat rectangular tube shape. A closing wall is provided on a front of the front cap **80**, and mating terminal insertion holes penetrate the closing wall in the front-rear direction. As shown in FIG. **8**, the front cap **80** is arranged such that an inner peripheral surface near a rear end is in contact with the outer peripheral surface of the base **21**A and a rear end faces the front end of the sealing ring **70**.

As shown in FIGS. **3** and **5**, a right lock piece **51**R and upper and lower right supports **52**R constituting the first lock **50** are provided on a right side of the terminal accommodating portion **21**, and a left lock piece **51**L and upper and lower lefts **52**L constituting the first lock **50** are provided on a left side of the terminal accommodating portion **21**. The right lock piece **51**R and the right supports **52**R, and the left lock piece **51**L and the left supports **52**L are provided at bilaterally symmetrical positions with the terminal accommodating portion **21** as a center, and the configurations thereof are bilaterally symmetrical with respect to the terminal accommodating portion **21**. Accordingly, only the right lock piece **51**R and the right supports **52**R are described as representatives below, and the left lock piece **51**L and the left supports **52**L are not described and are shown with a suffix R of reference signs for the right lock piece **51**L and the right supports **52**L replaced by L. Further, in the following description, the right and left lock pieces **51**L, **51**R may collectively be called first lock pieces **51**R, **51**L.

As shown in FIGS. **4** and **5**, the upper and lower right supports **52**R bulge laterally from the rear receptacle **22** and connect to upper and lower side walls of the lock projection receiving groove **22**B. The right lock piece **51**R is a flat strip-like small piece disposed between the right supports **52**R, and extends parallel to a side wall of the terminal accommodating portion **21**. The right lock piece **51**R is cantilevered while being supported on the upper right support **52**R at a position rearward of a center of the upper edge thereof and is supported on the lower right support **52**R at a position rearward of a center of the lower edge thereof, and the front and rear ends thereof are laterally movable. The rear end of the right lock piece **51**R projects somewhat rightward, and serves as a right releasing portion **53**R used by a worker to release the right lock piece **51**R. A laterally penetrating right holding hole **54**R is provided on a front part of the right lock piece **51**R.

As shown in FIG. **3**, the outer housing **30** includes a front receptacle **31** having a substantially rectangular tube shape and arranged on an outer periphery of the terminal accommodating portion **21** of the inner housing **20**, pedestals **55** formed by parts of outer side surfaces of the front receptacle **31** projecting laterally outward, a right lock projection **55**R and a left lock projection **55**L constituting the first locks **50**, a coupling receiving portion **32** and a second lock **60**.

The right lock projection **55**R projects rightward from the pedestal **55** and is provided at such a position as to be lockable to the right lock piece **51**R by being fit into the right holding hole **54**R of the inner housing **20** when the outer housing **30** is mounted on the outer periphery of the inner housing **20**. The left lock projection **55**L projects leftward from the pedestal **55** of the outer housing **30** and is provided

at a position bilaterally symmetrical with the right lock projection **55**R with the front receptacle **31** as a center.

With the outer housing **30** mounted on the outer periphery of the inner housing **20**, the first lock **50** is locked by fitting the right lock projection **55**R into the right holding hole **54**R of the right lock piece **51**R, as shown in FIGS. **2** and **10**.

The coupling receiving portion **32** couples the cover **40** to the outer housing **30**. As shown in FIGS. **3**, **6** and **7**, the coupling receiving portion **32** is composed of front and rear upper surface ridges **32**A, a lower surface ridge **32**B and a butting receiving portion **32**C.

The upper surface ridges **32**A project up from the front end of the upper surface of the front receptacle **31** and extend in the lateral direction. The lower surface ridge **32**B projects down from the vicinity of the front end of the lower surface of the front receptacle **31** and extends in the lateral direction. As shown in FIG. **3**, the butting receiving portion **32**C is a recess having a substantially right triangular shape in a front view and is surrounded by an outer side surface of the front receptacle **31**, the upper end of the pedestal **55** and right end parts of the front and rear upper surface ridge portions **32**A.

The second lock **60** is provided on an upper surface side of the front receptacle **31** and, as shown in FIG. **6**, is composed of an accommodation recess **62**A, two accommodating walls **62**B, a hand-touch restricting portion **62**C and an upper lock piece **63**.

The accommodation recess **62**A vertically penetrates through the front receptacle **31** and is open forward. The accommodating walls **62**B have a U-shape in a plan view to surround both sides and the rear end of the accommodation recess **62**A, and constitute an inner wall of the accommodation recess **62**A. The hand-touch restricting portion **62**C extends to close a front end opening between the accommodating walls **62**B and is U-shaped in a front view, as shown in FIG. **3**.

The upper lock piece **63** is in the form of a cantilever extending toward a front end with the rear end of the accommodation recess **62**A as a base. A through hole **63**A vertically penetrates through a substantially central part of the upper surface side lock piece **63**.

As shown in FIGS. **1** and **2**, the cover **40** is composed of an upper cover **40**A, a lower cover **40**B and a wire tube **43**A, and is a hollow body shaped such that the rear end of a somewhat flat rectangular tube extends toward one lateral side by assembling the upper cover **40**A, the lower cover **40**B and the wire tube **43**A. Note that, in the following description, an opening on a rear is referred to as a rear opening **43**B.

The cover **40** includes anti-slip portions **42** and cover locks **41**, as shown in FIG. **10** and a coupling portion **46** to be coupled to the outer housing **30** and a wire fixing portion **43**, as shown in FIG. **1**.

As shown in FIG. **2**, the anti-slip portion **42** is composed of an anti-slip piece **42**A provided to extend down from outer and inner surface of a side wall **47**A of the upper cover **40**A and an anti-slip ridge **42**B projecting laterally inward and outward from outer and inner surface sides of a side wall **47**B of the lower cover **40**B and extending in a vertical direction. Horizontal displacements of the upper and lower covers **40**A, **40**B are restricted by the contact of the anti-slip pieces **42**A and the anti-slip ridges **42**B.

As shown in FIG. **2**, the cover lock **41** is composed of cover lock pieces **41**A that extend down from the outer surface of the side wall **47**A of the upper cover **40**A and cover lock projections **41**C projecting laterally out from the outer side of the side wall **47**B of the lower cover **40**B. A cover lock hole **41**B laterally penetrates a lower part of each cover lock piece **41**A. The upper and lower covers **40**A, **40**B are assembled with each other by fitting the cover lock projections **41**C into the cover lock holes **41**B.

As shown in FIG. **2**, the coupling **46** is composed of an upper front frame portion **46**A provided on the upper cover **40**A, butting portions **46**C provided on the upper cover **40**A and two lower front frame portions **46**B provided on the lower cover **40**B. The upper front frame portion **46**A projects down from the front end of the ceiling wall **45** of the upper cover **40**A and extends in the lateral direction. The butting portions **46**C project down from both left and right ends of the upper front frame portion **46**A and have a right triangular shape in a front view. The lower front frame portions **46**B are separated from each other in the front-rear direction, project up from the front end of the bottom wall portion **48** of the lower cover **40**B and extend in the lateral direction.

With the cover **40** mounted on the female housing **10**, the coupling **46** (i.e. upper front frame portion **46**A, butting portions **46**C and lower front frame portions **46**B) is fit to the coupling receiving portion **32** (i.e. upper ridges **32**A, butting receiving portions **32**C and lower surface ridge **32**) of the outer housing **30**, as shown in FIG. **1**. In this way, the cover **40** and the outer housing **30** are coupled to each other.

Note that a clearance may be provided between the cover **40** and the outer housing **30**, considering a dimensional tolerance of each member, but any such clearance should not permit the inner housing **20** to contact the cover **40** even if the inner housing **20** moves with respect to the cover **40**.

As shown in FIG. **10**, the wire fixing portion **43** is composed of the rear opening **43**B and the wire tube **43**A fit into the rear opening **43**B. The inner peripheral surface of the rear opening **43**B and the outer peripheral surface of the wire tube **43**A are formed into wavy shapes corresponding to each other. In this way, the wire tube **43**A is fit tightly in the rear opening **43**B with a relative movement with respect to the rear opening **43**B and detachment from the rear opening **43**B prevented. The wires W pulled out from the rear surface of the female housing **10** are pulled out to outside from the tip of the wire tube **43**A through an internal space formed by the upper and lower covers **40**A, **40**B. Further, as shown in FIG. **11**, a tape T is wound from the wire tube **43**A to the wires W so that the wires W are fixed to the wire tube **43**A.

The female connector **1** of this embodiment if formed by inserting the female terminals **11** into the cavities **21**D of the inner housing **20** from behind with the wires W connected to the rear ends of the female terminals **11**. The outer housing **30** then is mounted on the terminal accommodating portion **21** of the inner housing **20** from the front, and the first locks **50** are locked. Further, the wires W pulled out from the rear surface of the inner housing **20** are inserted into the wire tube **43**A. The female housing **1** then is covered with the upper and lower covers **40**A, **40**B from above and below, and the cover locks **41** are locked while the wire tube **43**A is fit into the rear opening **43**B. The tape T then is wound from the wire tube **43**A to the wires W. In this way, the outer housing **30** is coupled to the cover **40** and the wires W are fixed to the cover **40**, thereby forming the female connector **1** in which the inner and outer housings **20**, **30** are locked displaceably.

This female connector **1** is connected to the mating housing **90** by inserting the mating housing **90** between the terminal accommodating portion **21** and the outer housing **30** and moving the mating housing back in the fitting space Si of the inner housing **20**. The mating housing **90** is inserted

to a position where the rear end thereof faces the rear wall **23** with a predetermined clearance defined therebetween while the outer peripheral surface thereof faces or slides in contact with an inner peripheral surface **31**A of the outer housing **30** (front receptacle **31**) and the inner peripheral surface thereof slides in contact with the three lips **71**A, **71**B of the sealing ring **70**. Along with this, the mating terminals **91** are inserted into the rectangular tubes of the female terminals **11** and are connected conductively to the female terminals **11** while being sandwiched with a predetermined contact pressure between the ceiling inner walls **11**B of the rectangular tubes and the spring pieces **11**A.

In this way, with the female connector **1** connected to the mating housing **90**, the inner housing **20** is held in close contact with the inner periphery of the mating housing **90** over the entire periphery via the sealing ring **70** and integrally held due to the contact pressure between the female terminals **11** and the mating terminals **91** in the terminal accommodating portion **21**.

In this state, clearances CL**2** are set between the first lock pieces **51**R, **51**L of the inner housing **20** and the first lock projections **55**R, **55**L of the outer housing **30** in the first locks **50**. In this way, the inner housing **20** is allowed to move with respect to the outer housing **30**.

On the other hand, the inner peripheral surface **31**A (an example of a mating contact portion) of the outer housing **30** (front receptacle **31**) is facing the outer peripheral side of the mating housing **90** across a clearance CL**1** due to dimensional tolerances and can come into contact with the outer peripheral side of the mating housing **90**.

The cover **40** is coupled to the outer housing **30**, as described above, covers the inner housing **20** while being sufficiently spaced apart therefrom, and is fixed to the wires W.

The wire W may move due to vibration or the like in this state. As a result, the cover **40** fixed to the wire W may contact the outer housing **30** together with the wire W. In this situation, the outer housing **30** moves and comes into contact with the mating housing **90** by being pushed by the cover member **40** so that any further movement is restricted. Also in this state, vibration from the wire W is allowed to escape to the mating housing **90** via the cover **40** and the outer housing **30** without being directly transmitted to the inner housing **20** since the inner housing **20** is relatively movable with respect to the outer housing **30** as described above. Specifically, the cover **40** and the outer housing **30** constitute a vibration transmitting member for transmitting the vibration of the wire W to the mating housing **90**.

If a clearance between the outer housing **30** and the mating housing **90** is the first clearance CL**1** and a clearance between the inner housing **20** and the outer housing **30** is the second clearance CL**2** as described above, the first and second clearances CL**1**, CL**2** are dimensioned to constantly satisfy CL**1**<CL**2** (=Formula 1) in this embodiment.

More particularly, it is assumed that a clearance between the inner peripheral surface **31**A of the outer housing **30** and the mating housing **90** and a clearance between the inner housing **20** and the outer housing **30** on a side leftward of the female terminals **11** and the mating terminals **91** are a left first clearance CL**1**_L and a left second clearance CL**2**_L, and a clearance between the inner peripheral surface **31**A of the outer housing **30** and the mating housing **90** and a clearance between the inner housing **20** and the outer housing **30** on a side rightward of the female terminals **11** and the mating terminals **91** are a right first clearance CL**1**_R and a right second clearance CL**2**_R, for example, as shown in FIG. **11**. It is further assumed that the outer housing **30** moved rightward to contact the mating housing **90** (i.e. a value of the left first clearance CL**1**_L became zero).

At this time, the inner housing **20** and the mating housing **90** are integrally fixed, the right first clearance CL**1**_R is maximized and the right second clearance CL**2**_R is minimized. However, since CL**1**_R<CL**2**_R (=Formula 1') is satisfied between CL**1**_R and CL**2**_R by the above Formula, the right second clearance CL**2**_R does not become zero. Specifically, even if the outer housing **30** contacts the mating housing **90**, the inner housing **20** is kept relatively movable with respect to the outer housing **30** on an opposite side across the female terminals **11** and the mating terminals **91**.

In this way, even if the cover member **40** moves in a direction perpendicular to an axial direction of the female terminals **11** by receiving the vibration of the wire W and comes into contact with the outer housing **30** to give an impact, the impact due to contact is allowed to escape to the mating housing **90** via the outer housing **30** while the inner housing **20** is caused to float with respect to the outer housing **30** in an internal space of the cover **40**.

Note that, although not shown, the inner housing **20** and the outer housing **30** similarly are dimensioned to satisfy the first clearance CL**1**<the second clearance CL**2** in each part also in the axial direction of the female terminals **11**.

By the above configuration, the connector (female connector **1**) according to this embodiment includes the inner housing **20** having the wires W pulled out to outside therefrom and to be connected to the mating housing **90**. The connector also has the vibration transmitting member **30**, **40** including the mating contact portion (inner peripheral surface **31**A) capable of coming into contact with the mating housing **90**. The vibration transmitting member **30**, **40** includes the wire fixing portion **43**, to which the wires W are fixed. Thus, vibration from the wire fixing portion **43** can be transmitted from the mating contact portion **31**A to the mating housing **90**, and the inner housing **20** is allowed to move with respect to the vibration transmitting member **30**, **40**. According to this configuration, if the wire W vibrates, that vibration is absorbed by the mating housing **90** via the vibration transmitting member **30**, **40** from the wire fixing portion **43**. Thus, vibration transmitted to the inner housing **20** from the wire W can be reduced. Even if vibration is transmitted from the wire W to the inner housing **20**, the vibration transmitted from the wire W can be attenuated since the inner housing **20** is allowed to move with respect to the vibration transmitting member **30**, **40**. In this way, the vibration attenuated by a relative movement of the inner housing **20** can be suppressed by a contact pressure between the terminals **11**, **91**, for example, in the case of accommodating the terminals **11**, **91** respectively into the inner housing **20** and the mating housing **90** and bringing the terminals **11**, **91** into contact with each other. Thus, wear caused by sliding movements of the terminals **11**, **91** can be suppressed.

Further, the inner housing **20** includes the lock pieces **51**R, **51**L, to which the lock projections **55**R, **55**L of the vibration transmitting member **30**, **40** are lockable, and the clearance CL**1** for allowing the inner housing **20** to move with respect to the vibration transmitting member **30**, **40** is provided between the lock projections **55**R, **55**L and the lock pieces **51**R, **51**L. According to this configuration, by locking the lock pieces **51**R, **51**L of the inner housing **20** to the lock projections **55**R, **55**L of the vibration transmitting member **30**, **40** without the inner housing **20** being connected to the mating housing **90**, these components can be handled integrally. Further, the inner housing **20** and the vibration transmitting member **30**, **40** can be handled integrally while

a relative movement of the inner housing **20** is ensured since the clearance CL**1** is provided between the lock projections **55**R, **55**L and the lock pieces **51**R, **51**L.

Further, the vibration transmitting member **30**, **40** includes the outer housing **30** having the mating contact portion **31**A and configured to cover the inner housing **20**, and the cover **40** having the wire fixing portion **43** and configured to cover the outer housing **30** and the wires W. According to this configuration, the inner housing **20**, the outer housing **30** and the wires W can be covered and protected from outside by the cover **40**.

Further, the outer housing **30** is facing the mating housing **90** across the first clearance CL**1**, and facing the inner housing **20** across the second clearance CL**2** larger than the first clearance CL**1**. According to this configuration, even if the outer housing **30** comes into contact with the mating housing **90** (i.e. moves a dimension of the first clearance CL**1**), the outer housing **30** does not come into contact with the inner housing **20** and vibration from the wire W is not transmitted directly to the inner housing **20** since a moving distance of the outer housing **30** is shorter than a dimension of the second clearance CL**2**.

The invention is not limited to the above described and illustrated embodiment. For example, the following embodiments can be employed.

The vibration transmitting member **30**, **40** is constituted by the outer housing **30** and the cover **40**, and the outer housing **30** is relatively movable with respect to the cover member **40** in the above embodiment. However, a cover may be fit tightly to an outer housing and the outer housing does not float with respect to the cover member. In this way, vibration from a wire can reliably escape to a mating housing. Alternatively, a cover and an outer housing may be integrated to form a vibration transmitting member. In this way, the number of components can be reduced.

Although the wire fixing portion **43** is constituted by the wire tube **43**A and the rear opening **43**B in the above embodiment, the configuration of the wire fixing portion **43** is not limited to this. For example, the rear opening **43**B may have an inner diameter and a shape corresponding to the wires W, and the wires W may be directly tightly inserted into the rear opening **43**B.

Although the cover **40** constitutes the vibration transmitting member in the above embodiment, the vibration transmitting member may be provided separately from the cover **40** and, in this case, the cover **40** may be omitted.

Although the inner housing **20** and the outer housing **30** are handled integrally using the first locks **50** in the above embodiment, no first lock may be provided and an inner housing and an outer housing may be handled as separate members. Since the inner housing can be held out of contact with the outer housing with a mating housing connected to a female housing in this way, the transmission of vibration from a wire to the inner housing can be prevented more effectively.

Although the outer housing **30** is facing the mating housing **90** across the first clearance CL**1** and facing the inner housing **20** across the second clearance CL**2** larger than the first clearance CL**1** in the above embodiment, an outer housing may be held in close contact with a mating housing (i.e. the first clearance is zero). In this way, vibration from a wire can escape more reliably to the mating housing.

LIST OF REFERENCE SIGNS

1: female connector (connector)
20: inner housing
30: outer housing (vibration transmitting member)
31A: inner peripheral surface (mating contact portion)
40: cover (vibration transmitting member)
43: wire fixing portion
90: mating housing
CL**1**: first clearance
CL**2**: second clearance

The invention claimed is:

1. A connector, comprising:
an inner housing, a wire being pulled out to outside from the inner housing, the inner housing being connected to a mating housing; and,
a vibration transmitting member including a mating contact portion capable of coming into contact with the mating housing,
wherein:
the vibration transmitting member includes a wire fixing portion, the wire being fixed to the wire fixing portion, and is capable of transmitting vibration from the wire fixing portion to the mating housing from the mating contact portion,
the vibration transmitting member includes an outer housing having the mating contact portion and configured to cover the inner housing and a cover member having the wire fixing portion and configured to cover most of the outer housing and the wire,
the inner housing is allowed to relatively move with respect to the vibration transmitting member,
the inner housing includes a lock piece, a lock projection of the vibration transmitting member being lockable to the lock piece, and
a clearance for allowing the inner housing to relatively move with respect to the vibration transmitting member is provided between the lock projection and the lock piece.

2. The connector of claim **1**, wherein the outer housing is facing the mating housing across a first clearance and facing the inner housing across a second clearance larger than the first clearance.

3. A connector, comprising:
an inner housing having a base with opposite front and rear ends and a cavity extending through the inner housing in a front-rear direction from the front end to the rear end, a rear receptacle connected to the rear end of the base and projecting forward so that a forwardly open fitting space is defined between the base and the rear receptacle;
a terminal connected to a wire, the terminal being inserted in the cavity of the inner housing so that the wire extends rearward from the inner housing;
an outer housing fit in the fitting space and having a mating contact surface facing inwardly toward the base of the inner housing;
a cover fit over the inner housing and the outer housing, the cover having a wire fixing portion fixed to a part of the wire rearward of the inner housing; and
a mating housing fittable into the fitting space inward of the outer housing and outward of the base of the inner housing, a mating terminal disposed in the mating housing and being connectable to the terminal, wherein
the mating contact surface of the outer housing faces an outer surface of the mating housing across a first clearance in a direction transverse to the front rear direction, and
an outer surface of the outer housing faces an inner surface of the rear receptacle of the inner housing across a second clearance in the direction transverse to

the front rear direction, the second clearance being larger than the first clearance.

4. The connector of claim **3** wherein the cover is engageable with the outer housing but is spaced outward from the inner housing.

5. The connector of claim **3** further comprising a sealing ring mounted over the base of the inner housing and engaged with an inner surface of the mating housing.

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